



Influence of different concentrations of Indole Butyric Acid on Cuttings of Avocado

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Abstract

This research work was design to investigate the influence of different treatments of Indole Butyric Acid (IBA) on the cuttings of avocado. Cuttings of avocado were transplanted from the sand beds to the plastic bags after a year with mixture of soil garden, farmyard manure, and silt of equal proportion. The study was conducted in green house at University of Poonch Rawalakot, during 2017. The experiment was allocated within three replications, and each replication contained 25 cuttings under a completely randomized design with four treatments control, 4000 ppm, 5000 ppm and 6000 ppm. There were different varieties of Fuerte , Cylone purple , Bunched fruit contained cuttings of each replication. Analysis of the data for parameters (Number of roots per plant, Root length, Number of leaves, Shoot length, Shoot diameter, Root diameter, and Survival percentage) was performed according to CRD (Statistic 8.1). The present results exhibited that Feurete avocado variety performed better at 6000 ppm concentration of IBA in terms of survival percentage, high root and shoot growth.

Keywords: Avocado cuttings, varieties of Avocado, Level of IBA and Survival percentage

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1. INTRODUCTION

Avocado is a tropical fruit, and scientific name is “*Persea Americana*” belongs to family *Lauraceae*. It has two genera based upon structural and morphological base named as Persea and Eriodaphne. Avocado has a characteristic that it has adoptive nature and can be grow from tropic to 30° north and south. Horticultural races, which are used named as Mexican, West Indian and Guatemalan¹. Avocado is the most popular fruit crop now days. It has an exceeding demand due to its, taste, flavor, and dietary value. In world total

harvested area was 98656 metric tons per hectare (MT/Ha) and total yield 143170 metric tons per hectare (MT/Ha) in 2012¹⁰. The dominant variety of avocado grown in California is the Hass variety, which accounted for 85% of commercial production in California in recent years¹¹.

Avocado is medium large plant in nature usually having 18-18 m height and also spread like open wings but we can manage its height by pruning. First 5 to 15 years avocado complete its growth phase known as "Juvenile period". Avocado has a shallow root system and secondary roots provide main support to plant with 10-15ft rooting depth². Small pale or yellow flowers are born on auxiliary branches while multi panicles terminating a shoot bud. There are very low success rate of flowers to produce fruit average 200-300 mature fruits from 2 million flowers⁵. The fruit of avocado contain one seed like peach. The color of the skin of ripened fruit is dark green, green, yellow, dark yellow, purple or pink or may be light or dark maroon. The berry color also green or yellow, light yellow and brown of the ripened fruit. Its seeds rich in oil contents ranges from 8-48% depend upon freshness of fruit⁶. The rootstock generally produced through seedling while for propagation budding and grafting generally practiced throughout the world. The rootstock is beneficial for resistant characteristics against phytophthora disease of rotting and other diseases of similar regions, which may cause problems⁷. Avocado cutting with leaf of some cultivars under moisture condition produce 100% roots otherwise roots are not produce at all or difficult to produce⁸. Biennial bearing in 'fuerte' variety of avocado was due late harvesting when moisture reduced about 30-35% in tropical regions³. Recent work depicts that avocado have antioxidants along with very high quality of fiber contents⁴. Avocado used as an important component for salad because it contains fats. It is mix with the fruits that have the acid and with vegetables that are containing acids, some of them like citrus, pineapple and tomatoes, or the others, which are acid dressing. All these importance of avocado make an attraction for research on avocado in future benefits, so a number of institutes research on avocado in the world like Turkey. In Turkey by the discovery of the 'Fuerte' as a commercial cultivar they imported 42 cultivars of avocado for California and America for their research on the coastal areas of Great Turkey and its local demand for avocado is very high and the obtain a valuable results for avocado growing the coastal regions of Turkey⁹.

By the application of Indolebutyric Acid (IBA) in marcots, there was significant increase in rooting as compared with inhibiting axillary bud break on developing shoots; it also stimulates the root initiation. There are control (no Indolebutyric Acid (IBA) application), where no root growth was observed¹². Through the auxins application, plant root growth promoted¹³. Synthetically produced Indolebutyric Acid (IBA) responsible for inhibiting axillary bud in newly constituted shoots. Indolebutyric Acid (IBA) stimulates the root initiation but it also influenced through type of cutting, season and different physiological attributes of pomegranate¹⁴. Indolebutyric Acid (IBA) is more effective in root growth when applied at a rate of 5000 ppm concentration as compared with Naphthalene acetic acid (NAA) application¹⁵. In guava, Indolebutyric Acid (IBA) application enhance root formation as it enhances initiation radical growth, the number of rooted cuttings, increase the number and quality of the roots^{16,17}.

The aim of this study was to determine the influence of different concentrations of Indolebutyric Acid (IBA) on the cuttings of three different varieties of Avocado.

2. MATERIALS AND METHODS

2.1 Experimental area

The study conducted in green house research area of University of Poonch Rawalakot Azad Kashmir for investigation of the effect of different treatments of IBA on the cuttings of avocado. The avocado varieties obtained from National Agriculture Research Center, Islamabad.

2.2 Treatments

During the course of study, three varieties (Cyclone purple, Fuerte, Bunched fruit) used along with four level of treatments of IBA (0, 4000, 5000, 6000 ppm) for each variety.

2.3 Crop Husbandry

The avocado cuttings transplanted from sand beds to plastic bags after one year with mixture of garden soil, FYM and silt of equal proportion.

2.4 Experimental design and layout

The experiment laid out in CRD (Complete Randomized Design) with three replications and each replication contains 25 cuttings.

2.5 Studied traits

Analysis of the data for parameters (Number of roots per plant, Root length, Number of leaves, Shoot length, Shoot diameter, Root diameter, and Survival percentage) performed according to CRD (Complete Randomized Design). Mean of the traits ranked according to least significant differences (LSD) with Statistix 8.1.

3. RESULTS AND DISCUSSIONS

3.1 Number of leaves

Auxin is widely used on the stem cuttings for accelerating the formation of adventitious roots. The data pertaining to number of leaves is presented in Fig.1. The number of leaves per plant significantly affected by various concentrations of Indole Butyric Acid. Statistical analysis showed significant results at $P > 0.05$ regarding the effect of interaction but non-significant results for treatments and varieties. The data presented in Fig. 1 revealed that maximum number of leaves (11.431) recorded in V2 (Fuertes) while minimum number of leaves observed in V1 (Cyclone purple). Whereas maximum number of leaves (9.16) recorded in T4 treatment (6000 ppm) by V2 variety for cuttings while no leaves observed in T4 treatment (6000 ppm) in variety Cyclone purple. In comparison with variety to treatment significant differences observed, the maximum number of leaves (21.33) attained in T4 where IBA applied at 6000 ppm in V2 Fuerte, while lowest number of leaves observed in (T4) 6000 ppm of V1 Cyclone purple. It was probably due to more secondary roots production as roots initiation stimulated by the application of IBA which will leads toward better shoot growth as more leaves are produced^{12, 14}.

3.2 Shoot Diameter

Statistical analysis showed non-significant results at $P < 0.05$ regarding the effect of treatment, varieties and their interaction. The maximum diameter of shoot (2.87mm) (Fig. 2) recorded in V3 (Bunched Fruit) while minimum diameter in V1 (Cyclone purple). In order to discuss the treatments, the maximum diameter (2.86mm) recorded in T3 when treated with 5000 ppm of IBA, while minimum diameter observed in T4 where 6000 ppm concentration was used. In order to compare of shoot diameter for variety to treatments, non-significant differences were observed, the maximum shoot diameter (3.1817 mm) calculated in (T4) 6000 ppm of IBA of V3 (Bunched fruit) while, lowest diameter (0.00mm) was observed in (T4) 6000 ppm of IBA of V1 (Cyclone purple). It indicates that IBA application has no direct effect on shoot diameter.

3.3 Shoot length

Statistical analysis showed significant results at $P \geq 0.05$ regarding the effect of treatment. Shoot length was non-significantly affected by IBA concentrations (Fig. 3). High shoot length of (2.5833 cm) was observed in V1(Cyclone purple) and lowest recorded in variety 2 (Fuerte). While in treatments, the high shoot length observed in T1 with Control type while lowest shoot length recorded in T4 at 6000-ppm IBA concentration. In comparison of shoot length for variety to treatment non-significant results was observed, the maximum shoot length (6.58 inch) was observed in (T1) control type of V1 i.e. Cyclone purple, while minimum shoot length (0.0000 inch) was observed in T4 when treated with 6000 ppm concentration of IBA of variety 2 i.e. Fuerte. It reveals that shoot length is not affected by the application of IBA as root length directly affected.

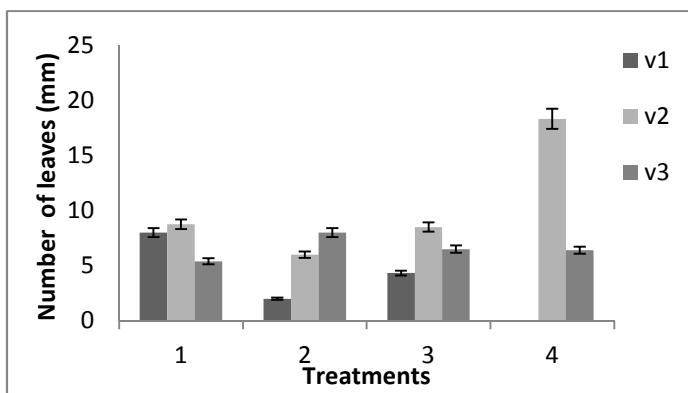


Fig. 1. Effect of IBA on number of leaves in avocado cutting

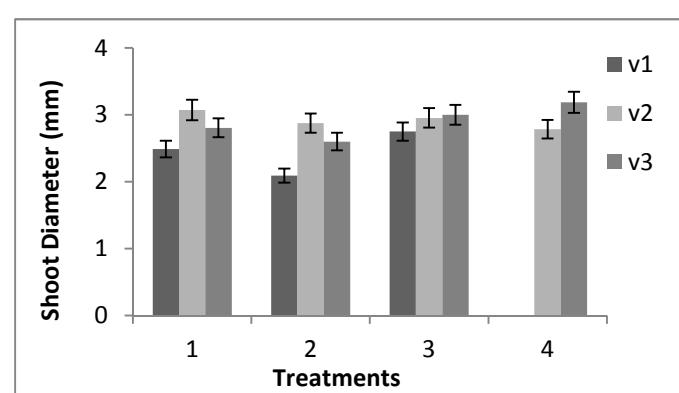


Fig. 2. Effect of IBA on Shoot diameter in avocado cutting

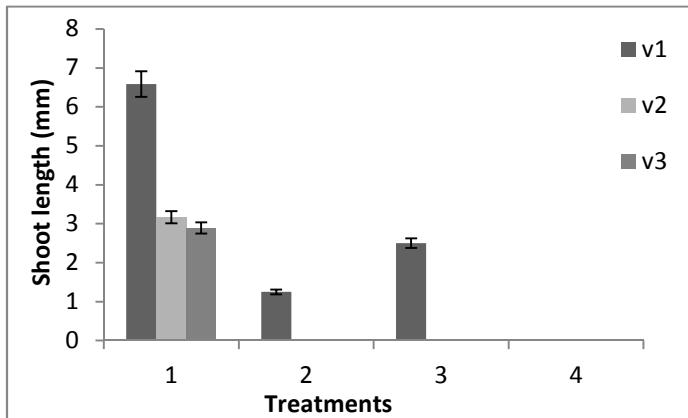


Fig. 3. Effect of IBA on shoot length in avocado cuttings

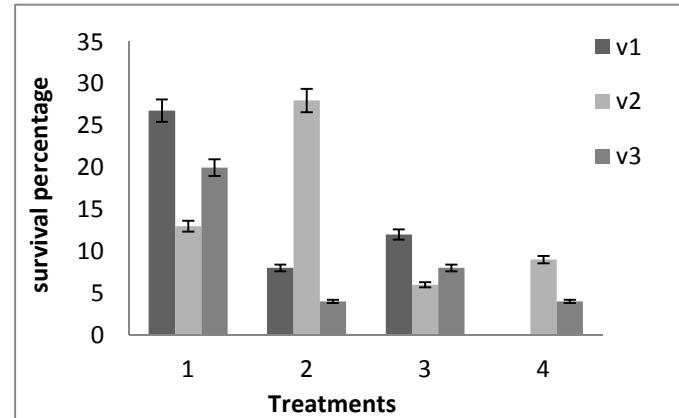


Fig. 4. Effect of IBA on survival percentage in avocado cutting

3.4 Survival Percentage

Statistical analysis showed non-significant results at $P > 0.05$ regarding the effect of treatment. Survival percentage non-significantly affected by IBA concentrations (Fig. 4). High survival percentage was recorded in variety 2 (Fuerte) and lowest was observed in variety 3 (Bunched fruit) while, in treatments high survival percentage was recorded in T1 at control and lowest survival percentage is observed in T4 when treated with 6000 ppm of IBA. In order to comparison of survival percentage for variety to treatments non-significant results was revealed, the maximum survival percentage (28%) observed in T2 (4000 ppm) of variety 2 (Fuerte), while minimum survival percentage (4%) was recorded in T2 (4000 ppm) of variety 1 (Cyclone purple). It is depicted that avocado cutting can tolerate lower concentration of IBA while at higher concentration of IBA there is more mortality percentage of cuttings. These results are in line with Ghosh *et al.*, ¹⁵, who suggested that when growth regulators applied in higher concentration there will be more mortality and less survival percentage of seedlings observed. This might be due sensitivity of seedling against higher concentration of growth regulator application at initial stand.

4. CONCLUSIONS

The present study exhibited that the avocado Feurete cutting treated with 6000 ppm IBA performed better results in terms of number of leaves that relates to better root growth followed by bunched fruit and Cyclone purple. While shoot diameter and length were not affected by IBA application at cutting stage. Cuttings survival percentage was very sensitive at initial stage and cannot tolerate higher concentration of IBA in avocado.

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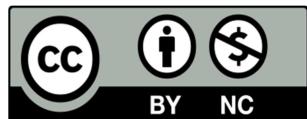
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CONFLICT OF INTEREST

All authors declare no conflict of interest regarding this article.

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